The B.C. Tidal Water Sportfishing Diary Program —1981

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THE B.C. TIDAL WATER SPORTFISHING

DIARY PROGRAM - 1981

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THE B.C. TIDAL SPORTFISHING DIARY PROGRAM - 1981

PREFACE

The B.C. Tidal Sportfishing Diary Program was initiated in 1979 to obtain estimates of the sport catch from B.C. tidal waters. The previous report was concerned with program development during 1979 and 1980. This report deals with the 1981 results and further developments in the program.

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THE B.C. TIDAL WATER SPORTFISHING DIARY PROGRAM - 1981

ABSTRACT

Bijsterveld, L. 1983. The B.C. tidal water sportfishing diary program - 1981. Can. MS Rep. Fish. Aquat. Sci. 1717: iv + 43p.

An angler diary program collected 1981 catch and effort data from B.C. tidal water anglers. During 1,521,100 angler days British Columbia anglers caught and kept a total of 619,800 salmon including 192,500 chinook and 308,200 coho. The chinook catch in 1981 was substantially less than 1980 while catches of other species demonstrated relatively little change. Most effort was from boats and directed towards catching salmon in general. An apparent increase in effort in 1981 was attributed to improved data collection. Catch per unit effort estimates are comparable to those obtained from other sources. Problems and improvements related to the diary program are reviewed.

Keywords: sportfishing, tidal waters, logbook, catch statistics

RÉSUMÉ

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Dans le cadre d'un programme mené en 1981, des données sur les prises et l'effort ont été recueillies auprés des pêcheurs à la ligne oeuvrant dans les eaux de marée de la Colombie-Britannique. Au cours de 1 521 100 jours de pêche à la ligne, ces pêcheurs ont capturé et gardé 619 800 saumons dont 192 500 quinnats et 308 200 cohos. Les prises de saumons quinnats étaient fortement inférieures à celles de 1980 tandis que le total des autres espèces variait peu. La plus grande partie de l'effort a été déployée à partir de bateaux et était dirigée vers la prise de saumon en général. Une augmentation apparente de l'effort en 1981 a été attribuée à une cueillette améliorée des données. Les estimations de la prise par unité d'effort sont comparables à celles obtenues d'autres sources. L'auteur présente une vue globale des problémes et des améliorations reliés à ce programme.

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THE B.C. TIDAL SPORTFISHING DIARY PROGRAM - 1981

INTRODUCTION

Since the early 1950's, estimates of the sport catch were made by Department fishery officers using various judgemental techniques. These estimates were published annually from 1956 to 1976. During the 1960's and 1970's, participation in the sportfishery grew drastically while new technologies increased the efficiency of the fishing effort. No corresponding improvements were made to the method of collecting sport catch statistics. As their workload in other areas increased with no increase in manpower, fishery officers were able to spend less time gathering sport catch statistics.

After the release of independent studies in the late 1970's (Anon 1977; Argue et al 1977; Harrison 1979) it was apparent that the Department's published estimates could be underestimating the sport catch of salmon by two to four times. The publication of annual sport catch statistics was discontinued after 1976. Since reliable estimates of sport catches are necessary for fisheries management, it was imperative that more accurate methods of estimating the sport catch be developed.

A review of statistical problems and suggested solutions was carried out during 1978. Brickley (1979) suggested that the major problem confronting sportfishing statistics was a lack of knowledge about the sportfishing population. In the absence of a licensing program even the number of sportfishermen was unavailable. Brickley recommended a mail survey of B.C. residents based on quarterly activity.

The Tidal Sportfishing Diary Program was initiated in 1979 as a possible method of obtaining more reliable estimates of the sport catch. During the first two years of the program, the emphasis was on the development of practical survey methodology. Inherent problems were identified and possible solutions were suggested. The major problems were related to identifying the sportfishing population and accessing a representative sample of that group, as well as accurate reporting and the need for more efficient techniques in the program.

In 1981, attempts were made to deal with some of these problems. Although the Diary Program is still developing, it shows the potential for becoming a reliable and relatively inexpensive method of obtaining sport catch and effort statistics.

METHODOLOGY

The initial stage of the Diary Program is the identification of sportfishermen. In 1981, a sample of approximately 16,000 residential phone numbers was systematically drawn from B.C. telephone books. A telephone survey was used to identify households containing sportfishermen aged 16 and older. Within each household, one individual sportfisherman was randomly chosen to receive a detailed questionnaire.

The questionnaire was part of the 1980 National Survey of Sportfishing conducted by the Recreational Fisheries Branch of the Department. Questionnaire recipients were asked if they would keep daily fishing records in the upcoming year. In addition to obtaining volunteers for the program, the questionnaires provided fishing data that were used to correct the estimates of catch and effort obtained from diary data. This is necessary because volunteers for the diary program are possibly more interested, and therefore more active and successful anglers.

There is also a possible bias associated with using data obtained from questionnaire respondents since these people may differ from non-respondents (Cochran 1977). In prior years, questionnaire non-respondents were surveyed by telephone. The data obtained were used to adjust the questionnaire data. However, in 1981 a follow-up survey was not carried out due to lack of personnel.

Questionnaire recipients volunteering to keep records of their fishing were sent diary booklets. A diary covering one quarter's activity was sent out every three months for a total of four diaries for the year. As each diary was

received by the participant, it served as a reminder to return the previous quarter's diary. If the booklets were not returned, attempts were made to obtain the information by telephone.

In the diaries, participants were asked to provide details about their fishing activity and catch. For each day of fishing, they were asked to record how they fished (from a boat, pier, shore, fishing bar or diving), the number of people fishing (party size), target species and the statistical area where they fished. The detailed catch of chinook and coho salmon by different size categories (under 12", 12" to 20", over 20") was also requested. Space was provided to record the catch of the following species: other salmon, cutthroat trout, lingcod, rockfish, red snapper, flatfish, herring, crabs, shrimps and prawns, oysters, clams, abalone and scallops. For each species, diarists were asked to record the total number caught and kept by the entire fishing party.

RESULTS

Returns

In the previous years, questionnaires were sent to a random sample from the voter's list. In 1981, questionnaires were sent to anglers only as identified by the telephone screen. Although the return rate was somewhat lower than in 1980 (Table 1), all of the respondents were anglers. The lower return rate in 1981 could be attributed to the length of the National Survey questionnaire. The booklet was seven pages long and the attempt to obtain detailed information about catch, effort and expenditures may have intimidated some recipients.

The proportion of respondents agreeing to keep diaries was similar to 1980. Although the absolute number of diary fishermen was lower than in 1980, the return rate was much higher. This is probably due to telephone reminders done throughout 1981. The proportion of diary fishermen actually fishing was also higher in 1981.

Table 1

Returns From the Tidal Diary Program

Questionnaires	1979	1980	1981
Number of questionnaires sent out	9,978	10,176	1,940
Total possible contacts		8,239	1,929
Number of returns	4,761	6,184	1,268
	(48%)	(75%)	(66%)
Number of sportfishermen	1,307	1,843	1,268
	(28%)	(30%)	(100%)
Number of initial diary fishermen	595	1,369	922
	(46%)	(75%)	(73%)
Diaries			
Number of diaries returned:			
1st Quarter	N/A	715	838
		(52%)	(91%)
2nd Quarter	N/A	664	703
		(49%)	(76%)
3rd Quarter	251	622	647
	(42%)	(45%)	(70%)
4th Quarter	146	593	655
	(24%)	(43%)	(72%)
Number of diary fishermen	137	321	464[1]
who actually fished	(23%)	(28%)	(50%)

1. Includes valid data only. Actual number of diary fishermen who fished is 502 although not all diaries could be used for analysis.

Resident Sportfishing Population

Estimating the population of anglers residing in B.C. posed a major problem in the absence of a licensing program. In 1979 and 1980, the population was estimated from the electoral lists (qualified voters, aged 18 and over). In 1981, the Tidal Water Sportfishing Licence Program was initiated. Since licences had not been required prior to 1981 and licensing did not commence until April of that year, it is probable that some anglers did not purchase licences. Therefore using the number of licences purchased would probably result in underestimating the number of anglers in B.C. Instead, the population of tidal water anglers (aged 16 and over) was estimated using 1981 census data and the estimate from the licences was used as a check.

The 1981 population estimates are presented in Table 2. Since all anglers do not necessarily fish, these are estimates of the population of active anglers in B.C., adjusted for non-participation.

In 1981, there were an estimated 215,000 anglers actively fishing in B.C. tidal waters. Licence sales provide an estimate of 172,400 active anglers. The population includes B.C. resident anglers aged 16 and over. The estimates from 1979 and 1980 presented in Table 3 include B.C. resident anglers aged 18 and over. Since the residence areas used for estimation changed from 1980 to 1981, the population is only broken down by regions for comparison.

Table 2

Population of Active B.C. Adult Tidal Water Anglers in 1981 by Regional District

Regional District	Anglers[1]
1. Capital District	32,600
2. Cowichan Valley	9,000
3. Alberni-Clayoquet	4,400
4. Nanaimo	16,800
5. Comox-Strathcona	16,600
6. Mount Waddington	4,000
7. Powell River	5,500
8. Sunshine Coast	2,900
9. Squamish-Lillooet	1,300
10. Greater Vancouver	80,300
11. Central Fraser Valley	7,200
12. Dewdney-Allouette	4,000
13. Fraser-Cheam	1,700
14. Okanagan-Similkameen	1,200
15. Central Okanagan	3,400
16. North Okanagan	1,700
17. Kootenay Boundary	1,200
18. Central Kootenay	1,000
19. East Kootenay	1,300
20. Columbia-Shuswap	600
21. Thompson Nicola	5,000
22. Cariboo	1,000
23. Fraser-Fort George	2,700
24. Peace River-Liard	1,500
25. Stikine	0
26. Bulkley-Nechacko	1,000
27. Kitimat-Stikine	4,000
28. Skeena-Queen Charlotte	2,700
29. Central Coast	400
Total	215,000
Adult Population[1]	2,112,865

[1] Aged 16 and over

Table 3

Population of Active B.C. Adult Tidal Water Anglers by Region

Region	1979[1]	1980[1]	1981[2]
Vancouver Island - Powell River	58,600	81,000	92,100
Greater Vancouver	74,800	70,600	80,300
Fraser Valley	24,400	30,000	13,000
Southern Interior	16,100	15,900	16,700
Northern B.C.	14,400	14,400	12,900
Total	188,300	211,900	215,000
Adult Population	1,550,175	1,541,467	2,112,865

1. Aged 18 and over
2. Aged 16 and over

Catch

Estimates of the 1981 salmon catch are given in Table 4. During 1981, B.C. residents removed a total of 620,000 salmon. The catch was composed of 193,000 chinook, 308,000 coho, and 119,00 other salmon. The total salmon catch decreased, compared to the catch in 1980 (Table 4). The most significant decrease was found in the catch of chinook. The 1981 chinook catch was approximately 50% of the 1980 catch, while the catch of other salmon appears to have more than doubled. Pink salmon has historically been the predominate species among the 'other' salmon caught by sport fishermen (Department of Fisheries and the Environment, 1977). In 'odd-years', such as 1981, large numbers of pink salmon migrate to the Fraser River for spawning (Neave, 1962), which accounts for the increased catch of other salmon in 1981. The catch of coho also decreased in 1981 but not as drastically as the chinook catch. The reduction in chinook and coho catch is particularly evident in the summer months (June, July, August).

The greatest reduction in the total salmon catch (number kept) occurred in the North and Central Coast region. From this region, the 1981 catch (Table 5) was less than 1/3 of the catch in 1980 (Table 6). This apparent reduction is probably due to differences between the population weights used in the 1980 and 1981 analyses (see Discussion). From the South Coast and Fraser region, the 1981 chinook catch decreased to approximately 50% of the 1980 catch. The catch of coho and total salmon catch from this region and the West Coast of Vancouver Island showed little change between 1980 and 1981. Of the total salmon caught, 90% were taken from the South Coast and Fraser region with Georgia Strait (areas 13-19, 28-29) contributing 70% of the total catch.

Estimates of the catches of other finfish in 1981 are given in Table 7. A total of 133,400 lingcod, 277,900 rockfish and 149,800 herring were caught and kept by B.C. residents. These numbers are similar to the 1980 catches. Lingcod catches were highest in the summer due to a winter closure for this species in some areas. Since there were no time restrictions for the other

Table 4

1980 and 1981 BC Resident Salmon Catch by Month

Month	Angler Days		Chinook Kept		Coho Kept		Other Salmon Kept		Total Salmon Kept	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
January	10,400	33,000	8,400	10,800	1,500	1,100	0	3,300	9,900	15,900
February	22,200	26,800	13,300	12,000	3,900	1,800	3,200	0	20,400	16,800
March	30,000	56,900	20,500	8,100	5,300	4,500	500	0	26,300	13,900
April	62,000	82,500	21,800	10,200	8,600	19,600	600	0	31,000	32,300
May	95,700	135,800	31,300	18,500	35,700	27,500	1,300	400	71,700	48,600
June	147,700	139,800	57,000	16,700	84,900	37,700	3,200	0	137,000	59,900
July	124,900	281,800	58,200	26,900	63,300	78,100	3,800	11,300	125,300	124,800
August	190,000	356,300	67,000	41,100	97,700	69,900	26,700	79,500	191,400	198,800
September	107,100	214,400	44,400	24,600	45,600	54,200	2,400	22,800	97,000	107,700
October	30,000	94,300	35,400	7,200	15,300	11,900	1,000	1,000	51,700	20,700
November	19,100	54,600	19,500	8,700	300	1,500	2,400	300	22,200	13,200
December	11,500	44,700	14,600	7,500	0	500	0	1,000	14,600	9,300
Total	850,700	1,520,900	391,400	192,300	362,000	308,000	45,100	119,500	798,500	592,400

Table 5
1981 Tidal Diary Program:
BC Resident Catch and Effort by Region ('000's)

	North & Central Coast (1-11)[1]	South Coast & Fraser River (12-20, 28-29)[1]	West Coast Vancouver Is. (21-27)[1]	Total
Total Angler Days	58.2	1,374.0	88.9	1,521.1
Chinook - Caught	8.8	368.3	56.7	433.8
Kept	3.9	162.3	26.3	192.5
Coho - Caught	9.7	543.8	19.9	573.4
Kept	8.9	282.4	16.9	308.2
All Salmon - Caught	28.3	1,040.0	79.0	1,147.3
Kept	16.7	558.3	44.8	619.8
Lingcod - Caught	1.3	203.9	21.0	226.2
Kept	1.2	115.8	16.5	133.5
Rockfish - Caught	20.3	369.5	34.7	424.5
Kept	18.0	231.5	28.5	278.0
Trout - Caught	3.2	18.3	8.1	29.6
Kept	3.2	14.0	3.8	21.0
Flatfish - Caught	13.5	25.7	.9	40.1
Kept	10.4	10.2	.9	21.5
Herring - Caught	2.6	179.1	.5	182.2
Kept	0	149.3	.5	149.8
Crab - Caught	151.4	310.8	41.1	503.3
Kept	57.7	138.9	14.1	210.7
Other Shellfish - Kept	189.4	832.1	71.7	1,093.2

[1] Department of Fisheries and Oceans statistical areas

Table 6
1980 Tidal Diary Program:
BC Resident Catch and Effort by Region ('000's)

	North & Central Coast (1-11)[1]	South Coast & Fraser River (12-20, 28-29)[1]	West Coast Vancouver Is. (21-27)[1]	Total
Total Angler Days	90.1	710.2	50.4	850.7
Chinook - Caught	76.4	621.3	53.5	751.2
Kept	31.2	327.7	32.5	391.4
Coho - Caught	25.8	524.2	14.1	564.1
Kept	18.9	329.0	14.1	362.0
All Salmon - Caught	104.1	1,185.7	70.4	1,360.2
Kept	52.0	697.1	49.4	798.5
Lingcod - Caught	15.6	163.6	11.0	190.2
Kept	10.5	114.8	8.6	133.9
Rockfish - Caught	31.8	312.5	14.0	358.3
Kept	28.1	218.4	7.2	253.7
Crab - Caught	189.7	333.3	61.2	584.2
Kept	85.3	102.3	22.2	209.8
Other Shellfish - Kept	54.1	369.3	0	423.4

[1] Department of Fisheries and Oceans statistical areas

species, the catches were spread out more evenly throughout the year, with the exception of herring. Half of the total herring catch was taken in March, coinciding with the spawning season. During spawning, the herring move inshore in concentrations and are more available to the sport fishery (Hourston and Haegle, 1980). The South Coast and Fraser region contributed over 80% of the lingcod, rockfish, and herring catches and over 65% of the cutthroat catch. A substantial portion (50%) of the flatfish were taken from the North and Central Coast region.

The catches of shellfish in 1981 are shown in Table 8. The catch of crab was similar to 1980 but the catch of other shellfish appears to have doubled. The crab catch was highest in the summer while other shellfish (oysters, clams) were gathered primarily in the spring. Most of the crab (65%) were taken from the South Coast and Fraser region with 25% taken from the North Coast and Central Region. Over 75% of the other shellfish were taken from the South Coast and Fraser Region. The harvesting of bivalves (oysters, clams, etc.) is prohibited in the other regions because of the danger of Paralytic Shellfish Poisoning. This restriction does not apply to shrimps, prawns and abalone.

Effort

Fishing from boats was the most popular type of fishing in 1981, accounting for over 85% of the total effort. This percentage was even higher in the late spring and summer when much of the angling effort is directed towards salmon (Table 9). Fishing from the shore was at its highest level in late winter and early spring which corresponds to an increased interest in shellfish. Most of the angling effort throughout the year was directed at catching salmon in general, with chinook and coho the most popular species. Effort towards chinook doubled in the winter months. Interest in groundfish and shellfish was comparatively low, particularly in the summer when salmon became more appealing.

Table 7

1981 Tidal Diary Program

Catch of Other Finfish by BC Residents by Month

	Lingcod		Rockfish		Cutthroat Trout		Flatfish		Herring		Other Finfish	
Month	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept
January	2,500	1,200	10,100	6,700	1,400	700	900	600	200	200	200	200
February	4,200	3,100	9,900	8,400	600	600	0	0	8,600	8,600	500	500
March	6,500	2,600	24,500	20,700	2,800	2,100	2,600	700	93,400	90,800	400	400
April	13,200	6,800	52,100	37,200	300	100	2,100	400	3,500	2,700	0	0
May	29,100	20,800	68,300	29,100	1,300	1,100	12,200	8,700	31,200	2,500	0	0
June	19,200	14,800	38,800	25,300	1,800	1,400	2,200	1,600	19,400	19,400	700	700
July	38,300	31,400	68,300	42,300	5,400	5,100	5,600	3,000	3,300	3,300	2,100	2,100
August	35,400	27,400	80,400	53,400	2,300	1,100	7,800	4,100	8,400	8,000	1,400	1,400
September	19,300	14,500	43,500	33,200	1,700	1,700	6,100	2,100	9,400	9,400	200	200
October	7,700	6,400	15,000	11,600	9,900	5,300	400	100	5,000	5,000	0	0
November	5,600	4,200	6,500	3,800	1,900	1,600	0	0	0	0	300	300
December	1,700	100	7,200	6,100	200	200	200	200	0	0	300	300
Total	182,700	133,300	424,600	277,800	29,600	21,000	40,100	21,500	182,400	149,900	6,100	6,100

Table 8

1981 Tidal Diary Program

BC Resident Shellfish Harvest by Month

Months	Crab		Oysters	Clams	Abalone	Shrimp, Prawns	Other Shellfish
	Caught	Kept	Kept	Kept	Kept	Kept	Kept
January	25,500	8,100	28,800	0	0	11,300	0
February	20,600	11,200	23,100	700	2,600	0	6,500
March	26,900	13,100	68,000	41,700	8,000	39,100	6,700
April	44,400	16,600	68,200	94,400	0	0	1,100
May	72,600	32,100	36,100	166,100	900	200	0
June	31,100	17,400	26,600	53,300	0	38,600	11,100
July	83,700	34,400	38,200	68,900	7,600	20,100	3,100
August	103,100	30,700	25,100	45,700	11,400	14,900	300
September	30,700	12,800	17,700	37,500	0	8,000	3,700
October	30,400	14,300	25,200	700	1,200	1,100	10,600
November	19,400	7,900	0	0	0	0	3,700
December	14,900	12,000	1,200	3,700	5,800	0	4,200
TOTAL	503,300	210,600	358,200	512,700	37,500	133,300	51,000

Table 9

1981 Tidal Diary Program

Percentage of BC Resident Anglers Targetting on Different Species Each Month[1]

Month	Chinook	Coho	Other Salmon	Any Salmon	Groundfish	Shellfish	Anything	Other
January	47	7	0	24	5	11	0	6
February	43	2	0	18	6	17	4	10
March	31	3	0	24	11	19	4	8
April	18	10	0	39	16	13	3	0
May	23	17	0	38	13	8	1	1
June	24	20	0	41	7	5	1	1
July	19	26	1	36	8	6	3	2
August	23	25	4	36	5	5	1	0
September	20	32	3	35	5	3	1	1
October	19	27	0	27	10	12	1	6
November	41	6	1	28	13	7	1	5
December	48	2	1	25	5	14	1	3
TOTAL	24	21	2	35	8	7	2	2

[1] Since some anglers target on more than one species at a time, the percentages across each month may total more than 100%.

The estimate of total fishing effort in 1981 is almost double that of 1980. The higher estimate obtained in 1981 probably does not reflect an actual doubling of effort but, rather, better reporting of days fished (see Discussion). Most of the effort (90%) occurred in the South Coast and Fraser region, in Georgia Strait and near major population centres (Vancouver, Victoria). Georgia Strait attracted anglers from many areas of B.C., as indicated in Table 10. For example, in area 13 (Campbell River), local residents accounted for only 59% of the effort. In other areas, local residents accounted for higher percentages of the effort. Most residents of coastal areas tend to fish near where they live (Table 11)).

Catch/Effort

In 1981, the catch per angler day from all areas was .13 chinook, .20 coho, and .41 for all salmon combined. The catch of chinook per angler day was highest in the winter and lower but fairly level during the rest of the year. For coho, the catch per angler day was lowest during the winter, increasing in spring and summer and peaking in June and July.

DISCUSSION

During the 1981 program, some of the problems previously identified were resolved. One problem apparent in 1979 and 1980 was the small proportions of diary fishermen that were actually fishing. For these two program years, respondents were considered to be eligible sportfishermen if they intended to fish in the upcoming year. Unfortunately only about 25% of the original diary fishermen actually did fish. For the 1981 program, diary fishermen were part of a group of anglers identified as having fished the previous year. The proportion of active anglers among the original diary fishermen was double that of 1979 and 1980 (Table 1).

Another problem identified in the program was that of response bias. Diary fishermen tend to be more active and successful than anglers not volunteering

TABLE 10

1981 TIDAL SPORT FISHING DIARY PROGRAM

TABLE VII: ANGLER COMPOSITION (BY RESIDENCE AREA) IN EACH STATISTICAL AREA (PERCENTAGE ANGLER DAYS)

RESIDENCE	STATISTICAL AREAS																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Capital District	0	0	0	0	0	0	0	0	0	0	0	4	1	4	3	1	3	42	71	79	100	0	9	0	0	0	0	1	1
Cowichan Valley	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	4	23	1	1	0	0	0	0	0	0	0	0	0
Alberni - Clayoquet	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	0	0	0	60	57	0	0	0	0	0
Nanaimo	0	0	0	0	0	0	6	0	0	0	100	2	3	15	3	2	59	2	0	0	0	0	13	0	4	100	6	0	0
Comox - Strathcona	0	0	0	0	0	0	0	0	100	0	0	18	59	44	8	0	0	0	0	0	0	0	0	0	87	0	6	0	0
Mount Waddington	0	0	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Powell River	0	0	0	0	0	0	0	0	0	0	0	0	0	8	27	24	7	0	0	0	0	0	0	0	0	0	0	0	0
Sunshine Coast	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	12	5
Squamish - Lillooet	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	6	2
Greater Vancouver	6	17	25	24	0	2	0	38	0	0	0	19	23	13	59	51	19	21	7	1	0	0	8	43	9	0	0	75	84
Central Fraser Valley	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0	3	1	7	0	0	0	0	0	0	0	0	0	0	6
Dewdney - Allouette	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3	0	0	0	0	0	0	0	0	0	5	1
Fraser - Cheam	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2	18	18	0	0	0	0	0	0	0	1	0
Okanagan - Similkameen	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central Okanagan	0	0	0	0	0	0	0	0	0	0	0	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Okanagan	0	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kootenay Boundary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0
Central Kootenay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East Kootenay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbia - Shuswap	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thompson - Nicola	0	0	0	0	0	0	0	27	0	0	0	0	4	4	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0
Cariboo	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser - Fort George	0	0	0	0	0	7	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	87	0	0
Peace River - Liard	0	66	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Stikine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulkley - Nechako	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kitimat - Stikine	0	0	75	13	0	82	0	0	0	0	0	3	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Skeena - Queen Charlotte	94	17	0	63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central Coast	0	0	0	0	0	0	88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 11

1981 TIDAL SPORT FISHING DIARY PROGRAM

TABLE VI: DISPERSION OF ANGLERS FROM EACH RESIDENCE AREA TO STATISTICAL AREAS FOR FISHING (PERCENTAGE ANGLER DAYS)

RESIDENCE	STATISTICAL AREAS																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Capital District	0	0	0	0	0	0	0	0	0	0	0	1	1	3	0	1	2	27	34	28	0	0	2	0	0	0	0	0	0
Cowichan Valley	0	0	0	0	0	0	0	0	0	0	0	1	1	13	0	0	14	66	3	2	0	0	0	0	0	0	0	0	0
Alberni - Clayoquet	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	1	9	2	0	0	0	0	79	1	0	0	0	0	0
Nanaimo	0	0	0	0	0	0	0	0	0	0	0	1	3	20	0	3	65	2	0	0	0	0	5	0	1	0	1	0	0
Comox - Strathcona	0	0	0	0	0	0	0	0	0	0	0	6	39	42	1	0	0	0	0	0	0	0	0	0	11	0	1	0	0
Mount Waddington	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Powell River	0	0	0	0	0	0	0	0	0	0	0	0	0	17	6	63	14	0	0	0	0	0	0	0	0	0	0	0	0
Sunshine Coast	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	52	1	0	0	0	0	0	0	0	0	0	0	0	0
Squamish - Lillooet	0	0	0	0	0	0	0	0	0	0	0	0	16	8	0	14	3	0	0	3	0	0	0	0	0	0	0	32	13
Greater Vancouver	0	0	0	1	0	0	0	1	0	0	0	3	7	6	2	25	7	7	2	0	0	0	1	0	1	0	0	17	20
Central Fraser Valley	0	0	0	0	0	0	0	0	0	0	0	6	10	2	0	19	8	32	0	0	0	0	0	0	0	0	0	0	22
Dewdney - Allouette	0	0	0	0	0	0	0	0	0	0	0	0	2	16	0	2	13	29	0	0	0	0	0	0	0	0	0	31	7
Fraser - Cheam	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	7	6	47	36	0	0	0	0	0	0	0	1	1
Okanagan - Similkameen	0	0	0	0	0	0	0	0	0	0	0	56	0	44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central Okanagan	0	0	0	0	0	0	0	0	0	0	0	32	16	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Okanagan	0	0	0	0	0	0	0	0	0	0	0	50	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kootenay Boundary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Central Kootenay	0	0	0	0	0	0	0	0	0	0	0	0	33	0	0	0	33	0	0	0	0	100	0	0	0	0	0	0	0
East Kootenay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
Columbia - Shuswap	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thompson - Nicola	0	0	0	0	0	0	0	16	0	0	0	0	25	37	0	0	0	7	13	0	0	0	0	0	0	0	0	0	2
Cariboo	0	0	0	0	0	0	0	92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0
Fraser - Fort George	0	0	0	0	0	9	0	0	0	0	0	0	7	0	0	4	0	0	0	0	0	0	0	0	0	0	80	0	0
Peace River - Liard	0	29	0	0	0	0	0	0	0	0	0	0	0	43	0	0	29	0	0	0	0	0	0	0	0	0	0	0	0
Stikine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulkley - Nechako	0	0	0	0	83	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0
Kitimat - Stikine	0	0	3	5	0	42	0	0	0	0	0	5	0	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0
Skeena - Queen Charlotte	40	2	0	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central Coast	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

to keep diaries. Since total catch and effort estimates could be biased if these data were used alone, questionnaire data are used for bias correction. The data indicate that the bias is not constant throughout the year or for all species (Table 12). Diary fishermen fish more in the winter months and catch more chinook than other anglers. For the first two years of the program, the diary data were adjusted by the average days fished and salmon catch on an annual basis. The questionnaire for the 1981 program was designed to provide effort data by month and catch data by species to allow more refined adjustment of the diary data.

Another past concern has been the accuracy of reporting by the diary fishermen. The B.C. Tidal Waters Sport Fishing Guide containing colour photographs of all of the salmon species was supplied to all of the diary fishermen to assist in correct species identification. Of greater concern were the high estimates of catch per unit effort (CPUE) obtained from the diary results, as compared to other sources (Tables 13, 14). Two possible explanations were the overreporting of the catch or the underreporting of the number of days fished. In 1979 and 1980, diarists were asked to record their individual catch but it was discovered that many reported the boat or party catch instead since it was difficult to distinguish an individual's catch. It was also suspected that anglers were not reporting fishing days when nothing was caught, perhaps thinking that these days were of no value to the program. In 1981, diary fishermen were requested to report the total party catch as well as the party size for determination of the catch by an individual. Changing from reporting individual catch to boat catch appears to have resolved both problems of overreporting catch and underreporting effort as indicated by the CPUE estimates obtained from the 1981 diary results (Tables 13, 14).

It was impossible to solve all of the problems during the 1981 program. Identification of the angling population remained difficult and created problems. Mail and and telephone surveys of large numbers of people resulted in relatively small numbers of questionnaire returns and diary volunteers. Popular fishing and major population areas were sufficiently represented by

Table 12

1981 Tidal Diary Program

Comparison of Angler Activity in 1980[1]

Average Days Fished	Active Diary Fishermen	Other Anglers	Diary/Other
January	.66	.27	2.4
February	.62	.28	2.2
March	.74	.36	2.1
April	1.20	.72	1.7
May	1.86	1.08	1.7
June	2.54	1.70	1.5
July	4.07	2.64	1.5
August	4.47	2.93	1.5
September	2.84	1.76	1.6
October	1.38	.69	2.0
November	.68	.35	2.0
December	.64	.33	2.0
Average Annual Catch			
Chinook	6.75	2.25	3.0
Coho	7.60	3.70	2.1
Other Finfish	19.86	8.02	2.5
Crab	7.62	5.81	1.3

[1] 1980 National Survey results (unweighted) used for correction of 1981 diary data.

Table 13

Catch per Angler Estimates from the Tidal Diary Program

Year	Chinook	Coho	All Salmon	Source
1978	-	-	.65	1979 Tidal Diary - questionnaire
Jan - June, 1979	.21	.31	.65	1979 Tidal Diary - questionnaire
July - Dec, 1979	.40	.50	.98	1979 Tidal Diary - diaries
1979	-	-	.69	1980 Tidal Diary - questionnaire
1980	.46	.43	.94	1980 Tidal Diary - diaries
1980	.19	.28	.57	1980 National Survey of Sportfishing[1]
1981	.13	.20	.41	1981 Tidal Diary - diaries

[1] Used as 1981 Tidal Diary questionnaire

Table 14

Comparison of Catch per Angler Day from Tidal Diary Program and Creel Survey[1]

Time Period	Chinook	Coho	All Salmon	Source
July - Dec, 1980	.47	.49	1.03	1980 Tidal Diary Program
July - Dec, 1980	.15	.29	.44	1980/81 Creel Survey[2]
Jan - June, 1981	.13	.21	.35	1981 Tidal Diary Program
Jan - June, 1981	.22	.26	.48	1980/81 Creel Survey[2]
1981	.11	.20	.36	1981 Tidal Diary Program
1981	.15	.24	N/A	1980/81, 1981/82 Creel Survey[2]

[1] Georgia Strait (statistical areas 13-19, 28-29) only

[2] Original estimate has been converted from boat days using the average party size estimated from the Tidal Diary Program

questionnaire and diary data. However, some areas, particularly the North and Central Coast region, were represented by small numbers of questionnaires and diary fishermen. Most of the people fishing in this region reside in northern B.C. (Table 10). The catch and effort of the diary fishermen from a region are extrapolated to the total population of anglers in that region and corrected for possible bias using weights calculated from questionnaire data (see Appendix C). The 1980 catch and effort weights for northern B.C. anglers were five times the 1981 weights. The weight differences are due to differences in the numbers of diary fishermen and questionnaire data between the two years. This would account for the apparent decrease in catch and effort in the North and Central Coast region in 1981. Larger numbers of questionnaire returns and diary fishermen from northern B.C. are needed to reduce this variability.

The introduction of the BC Tidal Water Sportfishing Licence in April, 1981 alleviated this and other previously encountered problems. Commencing in 1982, the licence program enabled the following improvements:

1. Simpler, more reliable estimation of the population of B.C. resident anglers.
2. Preliminary questionnaire is sent to identified anglers resulting in more usable returns and more diary volunteers.
3. Access to non-B.C. resident anglers (for surveys outside of the Tidal Diary Program).

Since licences are only required by individuals aged 16 and over, the licence program does not access juvenile anglers. This problem is yet to be resolved.

Most of the major problems of the Tidal Diary Program appear to have been overcome with the advent of the licence program. Evaluation of the 1982 program should indicate the validity of this assumption and also indicate if any further modifications are necessary.

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APPENDIX A

SPECIES LISTS

Table A-1

Common and Scientific Names of Finfish Recorded by B.C. Tidal Water Anglers (Diary Program)

Common Name	Scientific Name
Pacific Herring	*Clupea harengus pallasi*
Chinook salmon	*Oncorhynchus tshawytscha*
Coho salmon	*Oncorhynchus kisutch*
Pink salmon	*Oncorhynchus gorbuscha*
Cutthroat trout	*Salmo clarki clarki*
Rockfish	*Sebastes* spp
Red Snapper	*Sebastes ruberrimus*
Lingcod	*Ophiodon elongatus*
Flatfish	Pleuronectidae

Table A-2

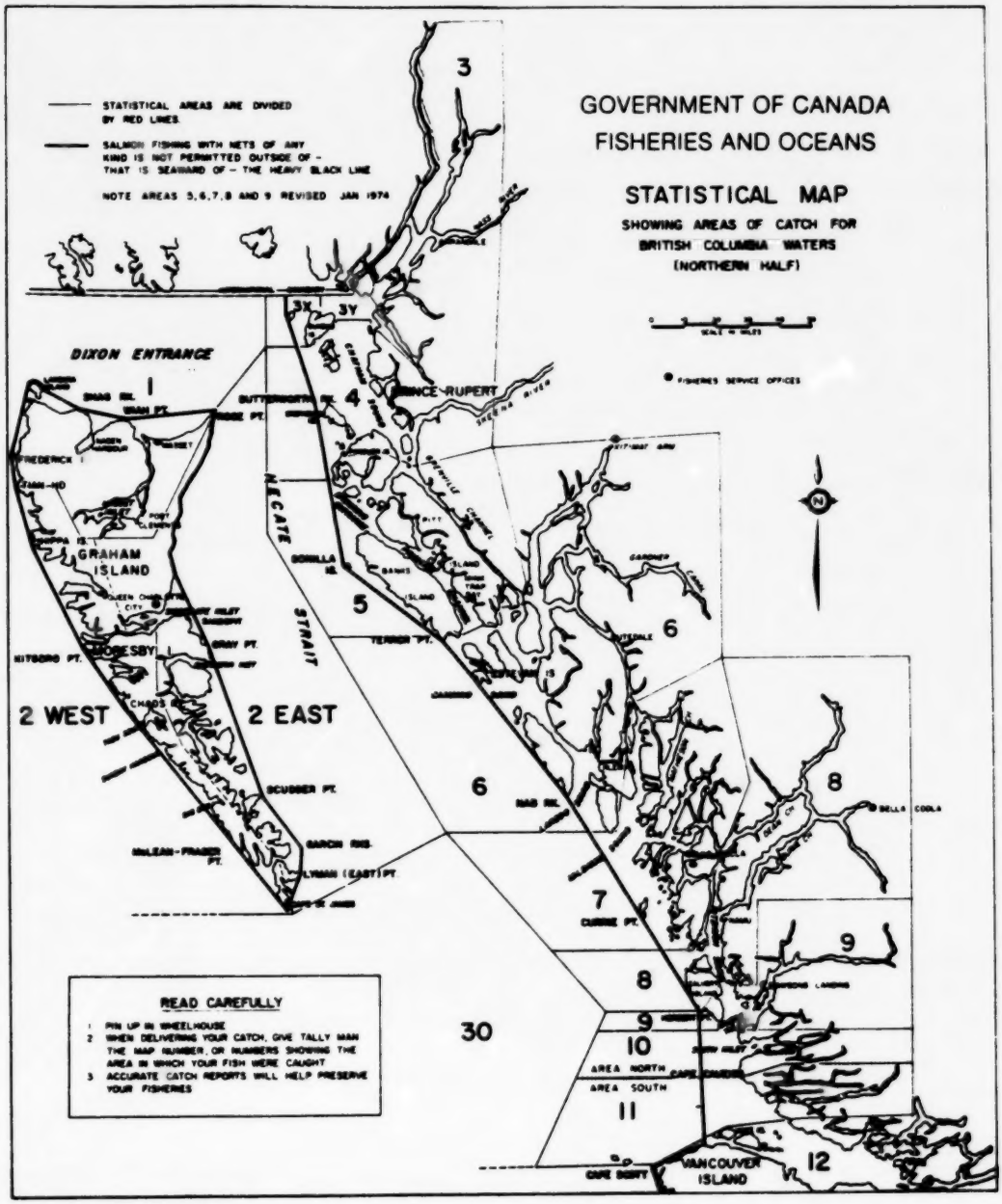
Common and Scientific Names of Mollusks and Crustaceans Recorded by B.C. Tidal Water Anglers (Diary Program)

Common Name	Scientific Name
Oysters	Ostreidae
Clams	Pectenidae, Solenidae, Veneridae
Abalone	*Haliotis kamschatkana*
Shrimp	*Pandalus* spp
Prawns	*Pandalus* spp
Crab	*Cancer productus*, *Cancer magister*, *Paralithodes camschatkana*

APPENDIX B

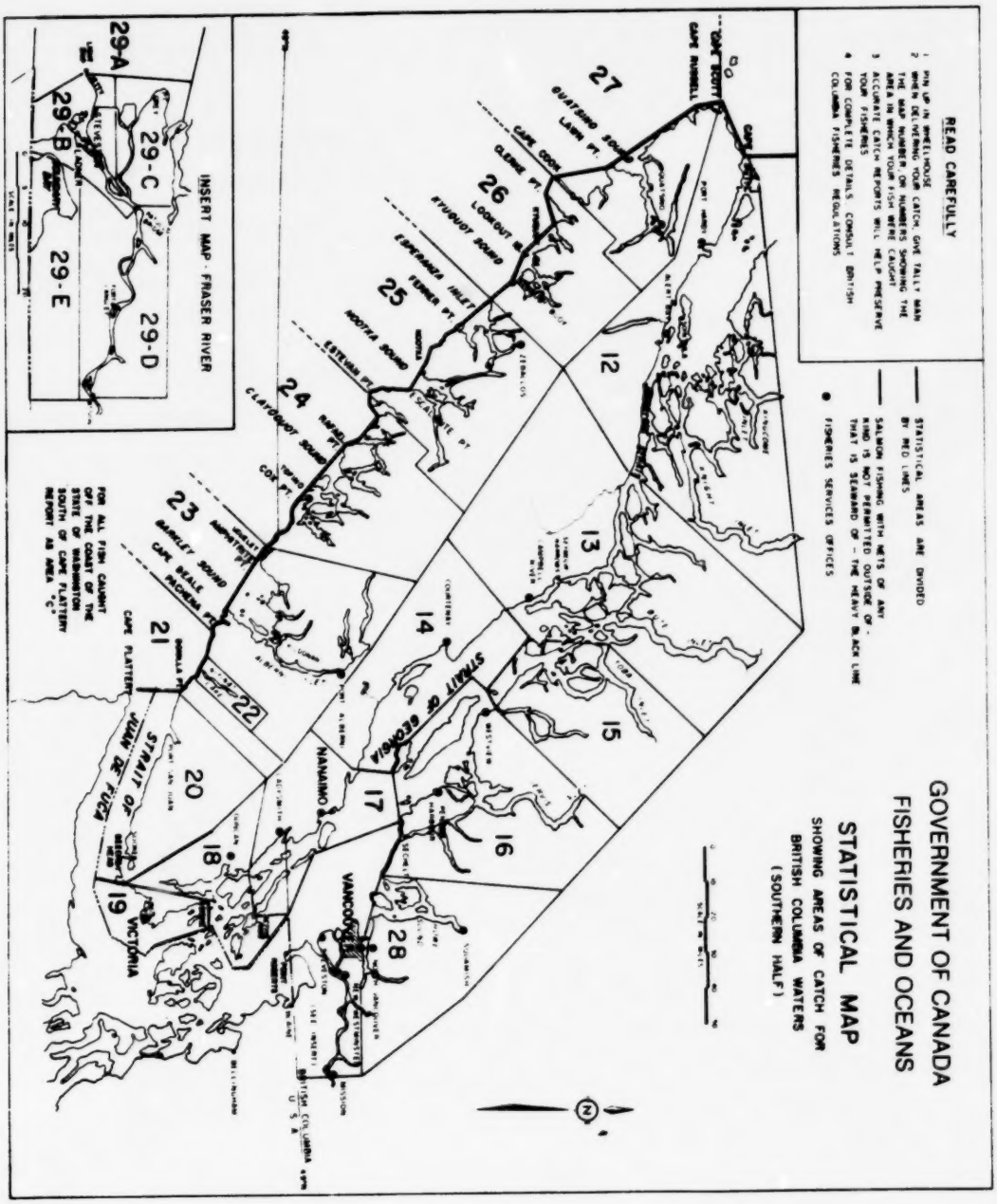
Statistical Area Maps

Map 1


GOVERNMENT OF CANADA
FISHERIES AND OCEANS
STATISTICAL MAP
SHOWING AREAS OF CATCH FOR
BRITISH COLUMBIA WATERS
(NORTHERN HALF)
STATISTICAL AREAS ARE DIVIDED BY RED LINES
SALMON FISHING WITH NETS OF ANY KIND IS NOT PERMITTED OUTSIDE OF - THAT IS SEAWARD OF - THE HEAVY BLACK LINE
NOTE AREAS 5,6,7,8 AND 9 REVISED JAN 1974
FISHERIES SERVICE OFFICES
DIXON ENTRANCE
HECATE STRAIT
GRAHAM ISLAND
PRINCE RUPERT
2 WEST
2 EAST
30
AREA NORTH
AREA SOUTH
VANCOUVER ISLAND
READ CAREFULLY
1 PIN UP IN WHEELHOUSE
2 WHEN DELIVERING YOUR CATCH, GIVE TALLY MAN THE MAP NUMBER, OR NUMBERS SHOWING THE AREA IN WHICH YOUR FISH WERE CAUGHT
3 ACCURATE CATCH REPORTS WILL HELP PRESERVE YOUR FISHERIES

Statistical Area Maps

Map 2



APPENDIX C
ANALYSIS OF DATA

1. ESTIMATING THE POPULATION OF ANGLERS

In 1979/1980, anglers were identified through mail questionnaires. Respondents were considered to be anglers if they intended to fish in the upcoming year. For the 1981 program, a telephone survey was used to identify anglers. A sample of approximately 16,000 residential phone numbers was drawn from B.C. telephone books. The telephone survey identified "sportfishing households" containing at least 1 person aged 16 or over who fished in tidal waters in 1980. One angler in each sportfishing household was randomly selected to receive the questionnaire. The number of anglers (aged 16 and over) was obtained from the questionnaire.

Telephone exchanges in the survey sample were assigned to a Regional District (a census district). The number of households in each District was obtained from the 1981 census results.

The number of anglers in each regional district i can be estimated:

$$ANG_i = \frac{ANGTOT_i}{RESQ_i} \times \frac{SFHOUSE_i}{REST_i} \times HOUSE_i$$

where ANG_i = estimated number of anglers

$ANGTOT_i$ = total number of anglers (from the questionnaire)

$RESQ_i$ = number of questionnaire respondents

$SFHOUSE_i$ = number of sportfishing households (from telephone survey)

$REST_i$ = number of successful phone contacts

$HOUSE_i$ = number of households (from 1981 census results)

The term: $\frac{ANGTOT_i}{RESQ_i}$ is the average number of anglers in each sportfishing household from the questionnaire respondents.

The term: $\frac{SPHOUSE_i}{RFST_i}$ is the proportion of sportfishing households among the general public.

The B.C. Tidal Water Sportfishing Licence was introduced in 1981 and provides an alternative estimate of the total population of anglers. Since licences had not been required prior to 1981 and licencing did not commence until April of that year, it is probable that some anglers did not purchase licences for 1981. Therefore, using the number of licences purchased will probably result in underestimating the number of anglers in B.C. However, the estimate can be used to verify the estimate obtained from the previously described method.

Residents of B.C. would have purchased either Resident Annual or One Day licences. In 1981, B.C. residents purchased 87% of the Resident Annual and 20% of the One Day licences. Therefore, from the licence sales, the estimated number of anglers in B.C. is:

$$ANG = (RSALES \times .87) + (DSALES \times .20)$$

where ANG = estimated number of anglers

RSALES = total Resident Annual licence sales

DSALES = total One Day licence sales

2. PROPORTION OF ACTUAL PARTICIPANTS

In 1979/80 a problem became apparent when only half of the diary fishermen who intended to fish actually did so. In 1979/80, diary fishermen were chosen partly on the basis of whether or not they intended to fish. In 1981, questionaires were only sent to people fishing the previous year and diary fishermen were volunteers from this group. It was believed that choosing diary fishermen from people who had fished in the past would yield a better proportion of active anglers among diary fishermen. Although the proportion did increase in 1981 it was still low enough to warrant using actual participation rates in the estimation of catch and effort.

Participation rates can be estimated from the diary fishermen. The number of active anglers is estimated using the proportion of diary fishermen who fished at least one day among those returning at least one diary. The correction for actual participation is made on a regional basis r because of the small numbers in many regional districts i.

The estimated number of active anglers among all anglers is:

$$ANGA_i = ANG_i \times \frac{ANGDF_r}{RESD_r}$$

where $ANGA_i$ = estimated active anglers from regional district i

ANG_i = estimated anglers from regional district i

$ANGDF_i$ = diary fishermen fishing a least one day and returning at least one diary, from region r

$RESD_r$ = diary fishermen returning at least one diary, from region r

Participation rates can also be estimated from questionnaire data from the 1982 program. For 1982, a random sample of 1981 licence holders was picked to

receive questionnaires. Recipients were asked whether they fished in 1981. An overall participation rate can be estimated using the responses to this question. The proportion of active anglers is:

$$\frac{ANGQ}{(RESQ + NRESQ)}$$

where ANGQ = estimated number of anglers who fished in 1981 among the possible questionnaire contacts

RESQ = questionnaire respondents

NRESQ = questionnaire non-respondents

$$ANGQ = ANGRQ + \left[\frac{ANGT}{REST} \times NRESQ\right]$$

where ANGRQ = questionnaire respondents who fished in 1981

ANGT = the number of anglers who fished in 1981, from the telephone survey

REST = successful contacts from the telephone survey of the questionnaire non-respondents

Therefore, from the questionnaire, the estimated number of active anglers is:

$$ANGA_i = ANG_i \times \frac{ANGQ}{(RESQ + NRESQ)}$$

For 1981, the number of active anglers was estimated from the 1982 questionnaire data.

3. ESTIMATING ANGLER EFFORT BY STATISTICAL AREA AND MONTH

The total effort in statistical area j is estimated from the number of days fished in that area in month k by diary fishermen from all regional districts i. The number of angler days fished by diary fishermen is weighted to correct for the greater average effort by diary fishermen using questionnaire data. Corrections are made on a regional basis because of small sample sizes. Diary fishermen fish more than other anglers throughout the year but the difference is greatest in the winter. Therefore, corrections are also made on a seasonal basis.

$$EFFORT_{jk} = \sum_{i} EFFORTD_{ijk} \times \frac{ANGA_r}{ANGDF_r} \times \frac{DAYS_{rq}}{DAYSD_{rq}}$$

where $EFFORT_{jk}$ = total estimated number of days fished in statistical area j during month k (angler days).

$EFFORT_{ijk}$ = number of days fished in statistical area j during month k by diary fishermen from regional district i.

$ANGA_r$ = total population of active anglers from region r.

$ANGDF_r$ = active diary fishermen from region r.

$DAYS_{rq}$ = average number of days fished in season q (1980) by questionnaire respondents (excluding diary fishermen) from region r fishing one or more days during 1980.

$DAYSD_{rq}$ = average number of days fished in season q of 1980 (from the questionnaire) by diary fishermen from region r fishing one or more days during the 1981 program.

The term $\frac{ANGA_r}{ANGDF_r}$ projects the effort to the total population of active anglers

the term $\frac{DAYS_{rq}}{DAYSD_{rq}}$ is the weighting factor used to correct the greater effort of diary fishermen.

4. ESTIMATING CATCH BY STATISTICAL AREA AND MONTH

The total catch of species s in statistical area j and month k is estimated from the catch of diary fishermen from all regional districts i. In 1981, the catch recorded in the diaries was the total party catch. Each day's catch is divided by the party size to obtain the catch from an individual angler. The catch of each species is weighted (using questionnaire data) to correct for the possible greater fishing success of diary fishermen. Corrections are made on a regional basis (because of small sample sizes), as well as by species.

$$SPECIES_{sjk} = \sum_i SPECIESD_{ijk} \times \frac{ANGA_r}{ANGDF_r} \times \frac{CATCH_{fr}}{CATCHD_{fr}}$$

where $SPECIES_{sjk}$ = total estimated catch of species s in statistical area j and month k.

$SPECIESD_{ijk}$* = catch of species s by diary fishermen from regional district i in statistical area j and month k.

$ANGA_r$ = total population of active anglers from region r.

$ANGDF_r$ = active diary fishermen from region r.

$CATCH_{fr}$ = average catch of species group f* in 1980 from questionnaire respondents (excluding diary fishermen) from region r fishing one or more days in 1980.

$CATCHD_{fr}$ = average catch of species group f* in 1980 (from the questionnaire) by diary fishermen from region r fishing one or more days in 1981.

The term $\frac{ANGA_r}{ANGDF_r}$ projects the catch to the total population of active anglers.

The term $\frac{CATCH_{fr}}{CATCHD_{fr}}$ is the weighting factor used to correct the greater fishing success of diary fishermen.

* Since the reported catch by diary fishermen is party catch,

$$SPECIESD_{ijk} = \Sigma \left[\frac{\text{PARTY CATCH}}{\text{PARTY SIZE}} \right]_{ijk}$$

Except for chinook and coho, the species catch by diary fishermen are weighted (from questionnaire data) by the combined catch of a group of species as follows:

Diary Catch		Questionnaire Catch
chinook	is weighted by	chinook
coho	is weighted by	coho
other salmon, lingcod, rockfish flatfish, herring	is weighted by	other finfish (lingcod, rockcod, dogfish, flatfish, herring combined)
clams, oysters, prawns, shrimp abalone, scallops	is weighted by	shellfish (crab, clams, oysters, prawns, shrimp combined)
crab	is weighted by	crab

5. CALCULATION OF CONFIDENCE INTERVALS

The interval for an estimated variable $\hat{X}$ can be stated:

$$\hat{X} - t_{.05(2)}S_{\hat{X}} < X < \hat{X} + t_{.05(2)}S_{\hat{X}}$$

with a .95 probability that the true value of $\hat{X}$ is within the calculated interval.

The variables of interest ($\hat{X}$) for confidence interval calculation are total days fished (effort) and total catch. These variables were estimated as follows:

$$\text{Total } \hat{X}_j = \sum_{ik}\sum (W_i \times \hat{X}_{ijk})$$

where Total $\hat{X}_j$ = the total effort or catch in statistical area j

W_i = the population weight times the bias correction weight for effort or catch, for anglers residing in area i

$\hat{X}_{ijk}$ = the days fished or catch by an individual (k) from i, fishing in statistical area j.

The estimated variances of these totals were calculated as:

$$S^2_{(\hat{X}_{totalj})} = \sum_{ik}\sum (W_i^2 \times S^2_{(\hat{X}_{ijk})})$$

with the following assumptions:

1. Weights (W_i) were measured without error[1].
2. Areas fished (j) are independent.

[1] Since the weights were estimated from questionnaire data, this assumption may be invalid. The variance calculation including estimation error is prohibitively expensive and, therefore, not feasible. The confidence intervals presented here are the minimum expected.

Confidence intervals were calculated for statistical area 29 (Table C-1), South Coast and Fraser region (Table C-2), and the entire coast (Table C-3). The total sample of active diary fishermen numbered only 464 and when considering smaller units, such as month and statistical area, sample sizes become even smaller. As a result, the confidence intervals for statistical areas are relatively broad as demonstrated by Area 29 (Table C-1). The narrowest confidence intervals are for angler day estimates, ranging from ±17% to ±63% for individual months with an interval of ±19% for the annual estimate. The intervals for annual catch estimates are larger -- ±42% for chinook and ±45% for coho. Intervals for lingcod and rockfish are even larger (±73% and ±72% respectively).

When considering regions, the situation improves. For the South Coast and Fraser region (Table C-2) the confidence interval for annual angler days is ±6%, ranging from ±11% to ±46% for individual months. The intervals for annual catch are: ±16% for chinook, ±15% for coho, ±17% for lingcod and ±21% for rockfish.

The intervals are only slightly narrower for the entire coast than those calculated for the South Coast and Fraser region. Since most of the catch and effort occurs in the South Coast and Fraser region, this is expected. The confidence interval for the entire coast (Table C-3) for total angler days is ±5% and varies by month from ±10% to ±44%. The total catch confidence, the interval is ±15% for chinook and ±14% for coho. The intervals for lingcod and rockfish are ±16% and ±18% respectively.

Table C-1

1981 Tidal Diary Program

95% Confidence Limits for Statistical Area 29

Month	Angler Days	Chinook	Coho	Other Salmon	Lingcod	Rockfish	Crab
January	5,400 ± 2,000	1,200 ± 1,100	0	400 ± 800	0	200 ± 400	1,800 ± 3,500
February	3,000 ± 800	0	0	0	0	0	600 ± 1,100
March	5,000 ± 2,100	0	0	0	0	200 ± 300	0
April	2,200 ± 0	100 ± 200	0	0	100 ± 100	400 ± 1,000	0
May	6,600 ± 3,300	1,200 ± 2,300	300 ± 700	0	500 ± 700	3,800 ± 6,400	5,500 ± 5,200
June	8,100 ± 1,400	500 ± 500	200 + 300	0	0	1,900 ± 3,600	1,200 ± 2,300
July	20,800 ± 13,100	1,400 ± 1,200	6,200 ± 5,900	0	400 ± 500	300 ± 600	2,000 ± 2,700
August	25,100 ± 10,700	2,300 ± 1,600	6,900 ± 4,500	800 ± 1,000	2,800 ± 3,000	3,200 ± 3,100	4,500 ± 6,300
September	15,500 ± 4,400	600 ± 700	2,300 ± 2,000	5,000 ± 5,100	500 ± 600	600 ± 700	4,900 ± 8,300
October	9,900 ± 6,100	300 ± 300	2,300 ± 2,800	0	100 ± 400	200 ± 600	0
November	2,800 ± 700	200 ± 400	300 ± 600	0	0	0	300 ± 600
December	1,400 ± 500	0	0	0	0	0	0
TOTAL	105,900 ± 19,900	7,900 ± 3,300	18,500 ± 8,300	6,200 ± 5,500	4,400 ± 3,200	10,900 ± 7,800	20,900 ± 13,000

Table C-2

1981 Tidal Diary Program

95% Confidence Limits for South Coast and Fraser Region (12-20, 28, 29)

Month	Angler Days	Chinook	Coho	Other Salmon	Lingcod	Rockfish	Crab
January	32,900 ± 6,000	10,700 ± 4,300	1,100 ± 1,100	3,200 ± 5,400	1,200 ± 1,800	6,500 ± 5,400	8,100 ± 10,000
February	25,700 ± 4,800	11,900 ± 17,600	1,400 ± 3,500	0	3,200 ± 4,800	8,000 ± 8,000	8,100 ± 10,500
March	51,700 ± 12,000	6,300 ± 4,000	3,400 ± 3,500	0	1,800 ± 1,400	19,700 ± 11,400	10,600 ± 14,600
April	74,000 ± 14,300	7,800 ± 3,500	18,600 ± 13,800	0	4,400 ± 2,500	27,200 ± 24,900	8,900 ± 10,800
May	125,200 ± 20,200	16,000 ± 5,300	26,700 ± 14,700	200 ± 500	18,500 ± 8,400	27,300 ± 11,700	22,500 ± 21,800
June	133,000 ± 17,900	14,000 ± 4,800	37,000 ± 14,100	0	10,500 ± 5,100	18,400 ± 8,600	7,700 ± 7,900
July	260,600 ± 31,100	22,500 ± 5,600	72,700 ± 20,700	9,700 ± 8,600	27,600 ± 10,600	34,000 ± 18,200	25,400 ± 19,600
August	311,800 ± 33,200	33,700 ± 11,300	63,600 ± 19,300	75,800 ± 28,300	24,400 ± 8,400	40,300 ± 13,300	20,500 ± 12,800
September	173,900 ± 19,100	17,200 ± 8,400	46,000 ± 18,400	22,700 ± 10,700	13,400 ± 5,300	30,300 ± 15,700	8,400 ± 6,600
October	87,600 ± 23,500	6,300 ± 3,200	10,000 ± 5,500	800 ± 1,500	6,400 ± 4,400	10,500 ± 7,000	900 ± 1,500
November	53,700 ± 24,700	8,500 ± 6,000	1,500 ± 2,300	300 ± 400	4,200 ± 4,400	3,800 ± 3,600	6,100 ± 11,800
December	43,900 ± 12,600	7,400 ± 3,700	500 ± 1,000	1,000 ± 1,600	100 ± 300	5,600 ± 7,800	11,900 ± 15,600
TOTAL	1,374,000 ± 76,300	162,300 ± 26,500	282,400 ± 42,700	113,700 ± 31,800	115,800 ± 19,500	211,900 ± 44,000	138,900 ± 45,600

Table C-3

1981 Tidal Diary Program

95% Confidence Limits, Coastwide (1-29)

Month	Angler Days	Chinook	Coho	Other Salmon	Lingcod	Rockfish	Crab
January	33,000 ± 6,000	10,800 ± 4,300	1,100 ± 1,100	3,200 ± 5,400	1,200 ± 1,800	6,700 ± 4,900	8,100 ± 10,100
February	26,800 ± 4,900	12,000 ± 17,400	1,800 ± 3,600	0	3,200 ± 4,800	8,400 ± 7,900	11,200 ± 13,500
March	56,900 ± 12,200	8,100 ± 4,800	4,500 ± 3,900	0	2,600 ± 1,900	20,700 ± 11,200	13,100 ± 15,200
April	82,500 ± 14,700	10,200 ± 4,400	19,600 ± 14,200	0	6,800 ± 4,100	37,200 ± 27,000	16,600 ± 19,100
May	135,800 ± 20,600	18,500 ± 5,800	27,500 ± 15,100	400 ± 600	20,800 ± 8,700	29,100 ± 11,000	32,100 ± 30,000
June	139,800 ± 18,100	16,700 ± 7,100	37,700 + 14,300	0	14,800 ± 7,000	25,300 ± 16,500	17,400 ± 12,900
July	281,800 ± 31,800	26,900 ± 6,700	78,100 ± 21,100	11,300 ± 8,800	31,400 ± 11,000	42,300 ± 20,500	34,400 ± 24,800
August	356,300 ± 34,700	41,100 ± 11,800	69,900 ± 19,700	79,500 ± 28,500	27,400 ± 8,700	53,400 ± 16,500	30,700 ± 22,600
September	214,400 ± 21,400	24,600 ± 10,000	54,200 ± 19,300	22,800 ± 10,700	14,500 ± 5,400	33,200 ± 15,700	12,800 ± 9,800
October	94,300 ± 23,300	7,200 ± 3,400	12,000 ± 6,300	800 ± 1,500	6,400 ± 4,400	11,600 ± 7,000	14,300 ± 13,900
November	54,600 ± 24,100	8,700 ± 6,000	1,500 ± 2,400	300 ± 400	4,200 ± 4,400	3,800 ± 3,400	8,000 ± 11,900
December	44,700 ± 12,400	7,500 ± 3,700	500 ± 1,000	1,000 ± 1,600	100 ± 300	6,100 ± 7,700	12,000 ± 15,300
TOTAL	1,521,000 ± 78,100	192,500 ± 28,300	308,100 ± 44,100	119,200 ± 31,900	133,400 ± 20,900	277,900 ± 49,100	210,700 ± 61,200

Even if you fish infrequently, please complete the questionnaire.

SECTION A
YOUR PERSONAL FISHING ACTIVITY

1. Please indicate (✓) whether your sportfishing in British Columbia in 1980 was carried out in:

   a) Both fresh and tidal waters _____
   Tidal water only _____

   b) If you fished any days in freshwater, please indicate the total days you fished in B.C. freshwater in 1980. A "day" is all or any part of a day fished.

   _____ days

NOTE: ALL OTHER QUESTIONS REFER TO TIDAL WATER ONLY.

2. Please indicate the number of days you fished for sport in B.C. tidal waters for each category below:

   a) salmon fishing in saltwater _____ days
   b) other finfish in saltwater (e.g. rock cod, lingcod, etc.) _____ days
   c) bar fishing in the tidal portion of B.C. rivers
      (e.g. Fraser River below Mission) _____ days
   d) shellfish gathering or trapping _____ days

3. Please indicate the number of days you fished for sport in B.C. tidal waters each month in 1980.

Jan _____	Apr _____	July _____	Oct _____
Feb _____	May _____	Aug _____	Nov _____
Mar _____	June _____	Sept _____	Dec _____

4. Did you catch any fish or shellfish in B.C. tidal waters in 1980?

   YES _____ NO _____

   If yes, please indicate the number of each species you caught and kept in 1980. Add more species names as required.

Species	Number Caught	Number Kept	Species	Number Caught	Number Kept
Chinook salmon			Herring		
Coho salmon			Crabs		
Pink salmon			Clams		
Sockeye			Oysters		
Lingcod			Prawns		
Rock cod			Shrimp		
Cutthroat			Other (specify)		
Dogfish					
Flatfish					

5. a) Please estimate the total weight of the fish you kept. _____ lbs.

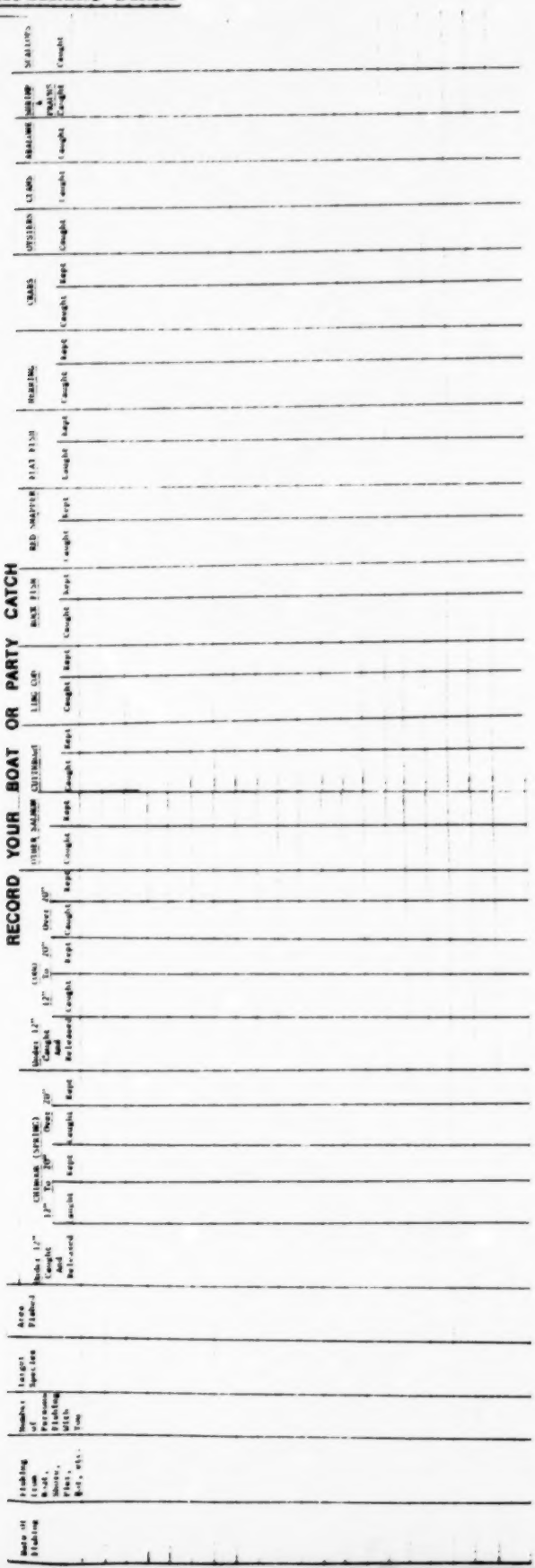
   b) What percentage of the above was:

   eaten by your household _____ %
   given to others _____ %
   other uses _____ %

6. Of the species available in B.C. tidal waters, which do you prefer to catch?

   FIRST _____ SECOND _____ THIRD _____

2. 1981 TIDAL SPORTFISHING DIARY



POOR

QUALITY

ORIGINAL